A close-up photograph showing a hand pouring a golden-yellow liquid, likely olive oil, from a clear glass bottle into a white ceramic bowl. The bowl contains some pasta, possibly farfalle. The background is blurred, showing more of the same bowl and a white surface.

Solutions for the food and marine-fishery value chain



About AZTI.

AZTI has over 30 years' experience and international presence in over 45 countries, boasts a team of over 240 experts, aimed at shaping ideas that, once transformed into products and services, generate business initiatives and recover and preserve natural resources.

It carries out strategic and applied research in an international context, providing comprehensive and innovative solutions for its clients in marine and food innovation. Transforming science into value and wealth for the society of today and tomorrow is the hallmark of AZTI.



Quality assurance

Accreditations and certifications:

AZTI is certified by ISO 9001:2008, ISO 14001:2004, ISO 27001:2007 and UNE 166.002:2006 standards and accredited by ENAC according to the criteria specified in the ISO 17025 standard for the testing of food products defined in the technical annex 167/LE320.

Management Quality Awards:

AZTI was awarded the Gold Q of the Basque Management Quality Award in 2011 and Gold A - Basque Advanced Management Award in 2015.





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02 Solutions for the port related
sectors.
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03 Solutions for the
food industry.
/ Pag. 10

04 Aquaculture solutions.
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05 Solutions for other industry.
/ Pag. 24

06 Solutions for administrations.
/ Pag. 26

07 Solutions for companies
in the animal feed and
pharmaceutical sectors.
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A large fishing vessel is shown from a low angle on the deck, looking out over the ocean. The ship's complex rigging of ropes and masts is visible on the right side. The sea is dark and choppy, with white foam from the ship's wake visible. A brown rectangular overlay covers the upper left portion of the image, containing the text '01 Solutions for the fisheries sector'.

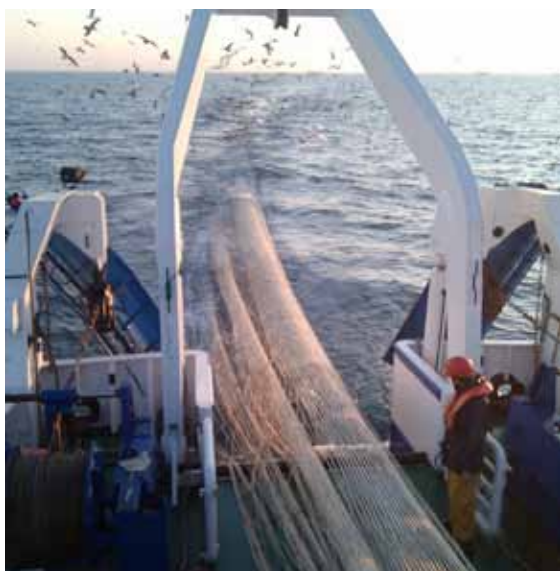
01

Solutions for the fisheries sector

01.1

Energy efficiency

- / **Vessel Energy Audits:** Analysis of vessel operations to find out how much fuel is consumed, when and why. We put forward technical and operational improvements and we analyse their technical and economic feasibility.
- / **Gestoil System:** Fuel consumption measurement and management system using various kinds of hardware and software including display screens for immediate consumption parameters enabling the reduction of gas oil consumption; and carrying out momentary changes to vessel operation pattern.
- / **Residual heat energy recovery systems:** Recover part of the waste heat, turning it into mechanical energy (propulsion assistance) or generate electricity without added consumption.



01.2

Fishing efficiency, efficacy, safety and sustainability

- / **Model-based Occupational Risk Prevention Management System:** Risk assessment and identification and improvement plans for each vessel and fishing mode.
- / **System to Improve fishing gear selectivity:** Optimise fishing activity performance to adapt it to regulatory requirements and solutions to reduce incidental capture (bycatch).
- / **Advice on the assessment of discard survival in the different gears:** Analysis of manoeuvres, equipment and operations increasing discard survival rates.
- / **Innovation systems in fishing gears and operations:** Improved fishing efficiency/effectiveness, increasing fishing safety.
- / **Recommendation service of fishing probability** of deep-sea fishing resources. Technical advice based on oceanography to predict shoal distribution and reduce fuel consumption and days at sea.
- / **Fishery certification and eco-labelling:** Assessment of certification possibilities, definition of improvements and collaboration to obtain them.

02

Solutions for the port and port-related sectors



02.1

Contingency plans and response to accidental spills

- / Identification of risks and vulnerable areas, providing effective responses.

02.2

Integral advice on dredging and spillage

- / Dredging plans
- / Material characterisation
- / Ocean sampling and laboratory analysis
- / Performance of environmental surveillance schemes
- / Multibeam bathymetry and draught control
- / Tide gauging and port reference updating

02.3

Integrated solutions for the use of discards and fishing by-products

02.4

Port facilities and processes

- / Ergonomic Improvement
- / Prevention of occupational hazards
- / Hygienic facilities and environmental design.

03

Solutions for the food industry



03.1

New foods

/ Integral new food creation service

Market surveillance, technology, legislation, subsidies and grants, patents

Product innovation plans: strategic environment analysis, internal analysis, DAFO to define strategies, definition and analysis and roadmap.

Definition, design, manufacture of food prototype at pilot scale and physical-chemical, microbiology, rheological, sensory and nutritional type definition.

Preparation processes: definition of new processing and optimisation lines of processes in place.

Determination of microbiological and sensory shelf-life and performance of acceptance and preference market tests.

Pilot plant and industrial plant tests: design of tests and analysis, validation of treatments, industrial escalation to plant and drafting of work instructions.

Transfer at industrial level and advice regarding market launching

Proposal of labelling and/or claims of nutritional properties for commercialisation

/ Innovation in high cuisine*: for the food industry and HORECA sector

Technology and global market surveillance.

Tailor-made ingredients:

Improvements of nutritional profiles; health claims; new textures and application forms.

Research and application of (new) ingredients: market and consumer adaptation

Viability adapted to the customer needs:

Product development and validation at pilot scale, maintaining organoleptic, nutritional or health qualities.

Study for the preservation of nutritional or health properties.

Life-shelf study for different conservation methods (refrigeration, freezing, sterilisation, etc.)

Sensory analysis as support through the product development

Research with consumers.

* AZTI and Mugaritz are working together from the creativity of chefs to the scientific-technological knowledge of researchers to achieve the final product.



/ **New foods with healthy and nutritional characteristics:**

Characterisation of new components and ingredients which have an impact on health (obesity, cardiovascular diseases and anti-inflammatory agents) improving their functionality through new technologies.

Design and development of products with healthy and nutritional properties as well as foods easier to consume for sensory-impaired people: products with new textures; flavour enhancement for total or partial salt removal; with sugar reduction and/or removal; gluten-free; fat reduction or replacement; rich in fibre, protein and/or fatty acids.

/ **New foods oriented to convenience, sustainability and pleasure:**

Develop new products aimed at meeting market demands such as convenience, comfort, quality, ethics and environmental awareness, focusing on the consumer and adapting to consumer needs (well-being, sports, etc.).

Improvement in ingredient properties through technological applications and processes.

Improvement of texture and sensory properties of food (through the optimisation of industrial processes and its impact on food micro structure properties, texture and organoleptic properties)



Innovation of products with better sensory properties, without additives, enriched, products for specific population niches (ethnic groups, senior population, organic, infant, food allergies, etc.)

Product orientation is adapted to industrial production and matters such as sustainability, eco-design and cost reduction (both regarding ingredients and processes) are also taken into account.

03.2

Sensory analysis

- / **New product development:** setting up product sensory profiles and measurement of degree of acceptance of new products before market launching
- / **Optimisation of formulae and processes:** product reformulation and determination of the impact from formula or preparation technology changes in the product sensory quality. Study on consumers to differentiate changes and into the added value achieved if any.
- / **Sensory quality control:** determination of a product compliance with the sensory quality specifications specified by law, by the customer (e.g. suppliers to large distributors) or internal company requirements.
- / **Shelf-life studies:** study on the real-time evolution of the sensory characteristics of a product under specific conservation conditions (product sensory shelf-life).
- / **Smell-gustatory defects:** determination of the product smell-gustatory profile and research on the existence or appearance of smell-gustatory defects in ingredients, raw materials and the end product.

03.3

Consumers & Market

- / **Identification and study of trends:** exclusive information on present and future trends to be turned into innovative products and/or services.
- / **Competitive surveillance:** identification and characterisation of market niches and impact trends.
- / **Market research on consumers:** throughout all development phases of new product concepts.

Acceptability, preference and purchase intention: measuring the acceptance, preference and purchase intention degree of products in target consumers.

Home Use Test: Home product delivery and measurement of the degree of acceptance, preference and purchase intention under real consumption conditions.

Benchmarking (Customer vs Competitors)

Research on consumer habits, needs and expectations

Research on context and emotions in product acceptability.

- / **Street surveillance:** Field work (direct market research), identifying and validating street trends at international level (The Food Mirror by AZTI).





03.4

Production efficiency and savings

/ Saving and eco-efficient production

Saving and eco-efficient

productions plans: Preparation of integrated operating plans to achieve savings and increase performance which involve reducing consumption of raw materials and auxiliary materials; packaging; increasing efficiency of use and handling; likewise preventing and reducing loss, waste, discharges and emissions.

Loss and wastage minimisation:

On-going multi-parameter monitoring systems. Combined technologies for wastage recovery.

Smart water management:

Continuous multi-parameter systems
Water reuse systems
3 discharge minimisation barriers
Smart water management and treatment.

/ Food chain 4.0

Monitoring, continuous automatic classification according to differentiating criteria with NIR, UV-VIS, Texture-strength, Vision and Microwaves.

Identification of critical quality, efficiency or differentiating parameters and attributes.

Identification, selection and validation of continuous **non destructive sensory solutions**.

Integration of signals and complex data processing.

BIG DATA - Process Analytical Technology (PAT):

Complex data treatment.

Processes and product quality predictive modeling.

Models generation for process automation and systems.

Sensor and control software integration**/ Ergonomic improvements**

Ergonomics study of equipment, processes, facilities and jobs which may impact employees' health. Ergonomic risk evaluation. Prevention of Work-Related Musculo-Skeletal Disorders (WRMSD).

Ergonomic optimization:

Ergonomic design and/or adaptation of equipment, processes, facilities, new technologies and jobs.

Training and practice for employees.

/ Valorisation of food by-products

Preparation of integral operating plans: Systems design and dimensioning of storage, collection, transportation and logistics. Product treatment / processing for its economic recovery. Technical and economic study of more profitable scenarios for recovery and circular economy in the short and / or long term. Applicable to the whole food industry chain.

Getting feasible bioproducts:

obtaining products of high added value (high value compounds, functional ingredients, etc.) from by-products. Biorefinery design. Getting high value products by bioconversion. Preindustrial validation of products and processes of production.

/ Environmental assessment and communication**Eco-design of new food products:**

via Life Cycle Analysis (LCA) a product or process can be optimised throughout the entire value chain.

Development of IT tools for economic and environmental evaluation and ecodesign

specific for a sector or company facilitating the implementation of cost-saving measures and providing added-value to the activity from an environmental and economic viewpoint. Tools on the web and desktop linked to the ERP system.

Environmental indicators:

Calculation of environmental carbon footprint, water footprint, etc. environmental certification of products, processes and environmental communication strategies.



03.5

Food Quality, Safety and Identity

/ Authentication:

Development of methods to authenticate species or their mixture, food, raw materials (fish, meat, vegetables, fruit, canned food, juice, surimi, etc.), food processes or sustainability standards.

Transfer of molecular techniques, including personnel training and advice.

Validation of molecular methodology (among laboratories and development of methodology standards) in traceability systems.

/ Food safety:

Decontamination services to reduce biological hazards (bacteria, fungi, virus, parasites, etc.) and chemical (pesticides, mycotoxins, allergens). Applicable to liquid and solid product decontamination as well as to thermal

and non-thermal processes.

Development of alternative methods to assess toxicity in new food components and potential food contaminants and mixtures: Zebra fish toxicity study.

Development of kits, sensors and methodologies to detect biological and chemical contaminants (pesticides, pathogens, allergens) and validating commercial methodologies.

Development of food with reduced biological and chemical risks via new technologies such as:

Food product decontamination using pulsed light.

Reduced allergenicity through processing technologies

Development of **management systems for quality and authenticity automatic control**.

03

Solutions for the food industry

Development and validation of smart systems (labels, sensors, etc.) to assess traceability throughout the food distribution chain.

03.6

Processing and preservation

/ Increased product shelf-life:

Using predictive micro-biology models oriented to products shelf-life

Technologies to improve shelf-life and quality of products: to prevent or reduce alterations (physical-chemical, microbiological and sensory) of fresh, minimally processed, processed, frozen, chilled products (pasteurized or not) and stored at room temperature (sterilised or dehydrated).

/ Process improvement and validation

Focus on **improving processes** (wastage reduction, costs, etc.) and end product price to be much more attractive for consumers.

Validation of new technologies in food processes from a quality viewpoint (physical-chemical characteristics, textures, organoleptic), nutritional composition (nutritional and healthy characteristics) and safety.





/ Technologies applied to improving sensoriality

Development of new textures via new technologies such as extension technologies to obtain dehydrated and crunchy food.

04

Aquaculture solutions



04.1

Production systems

- / **On-shore production systems:** RAS system optimisation; Sludge treatment system design; Energy audit for aquaculture systems/plants
- / **Offshore production systems:** Offshore farming technology design; Offshore bivalve mollusc farming operations
- / **Business development:** Business models, business plans and market study definition for public-private agents

04.2

Environmental management

- / **Spatial planning & aquaculture activity regulation:** Regulatory advice, site selection and ICZM.
- / **Environmental impact assessment studies**
- / **Hydrodynamic studies, marine chart display and seabed characterisation**
- / **Oceanographic surveillance and monitoring and installations**
- / **Monitoring of discharges**
- / **Technical aquaculture certification and standards (ISO, AENOR, etc.)**
- / **Load capacity studies in coastal areas**

04.3

New species and feeds

- / **Economic and market analysis to produce new aquaculture species**
- / **Metabolism, digestion and assimilation of new feeds**
- / **New sustainable raw materials** based on food industry by-products
- / **Onshore species farming:** Aquaculture species RAS fattening technologies

04.4

New foods based on aquaculture products

- / **Foods with nutritional and health-related properties:** New products; Quality and organoleptic properties and nutritional assessment; Design and development of strategies for functional food production; Profile improvement.
- / **Food design:** Development of new products, formats and doses; Products with balanced nutrient profiles; New textures; Restructured products; Ready-made (gourmet) meals.
- / **Eco - design of new aquaculture products**
- / **Sensory assessment and consumers:** Analysis of consumer acceptance of new products; Consumption awareness-raising and promotion plans.

04.5

Sustainability

- / **Valorisation of aquaculture by-products:** Value-added substances obtaining New food ingredients and products; Feed meals; Pet food. Energy recovery.
- / **Integrated management alternatives for massive mortality rates**
- / **Life-cycle assessment and sustainability indicators** (environmental footprint , carbon footprint, water footprint , etc.)
- / **Improved ergonomics and occupational safety**
- / **Eco-efficient technologies and production:** Water and energy saving; Improved productivity; Reduced losses, discharges and waste.

04.6

New technologies and processes

- / **Preservation and decontamination of aquacultural food products:** Technology to reduce biological and chemical hazards for food safety; Increased product shelf-life; Assessment of treatment impact on product properties.
- / **Transformation of aquacultural food products:** New process/technology development; New, intermediate and finished product generation; Physical-chemical, sensory, functionality and product safety assessment.





- / **On-line monitoring and classification:** multiparameter continuous monitoring of water quality ; nondestructive quality monitoring product (life prediction, quality grading, etc.)

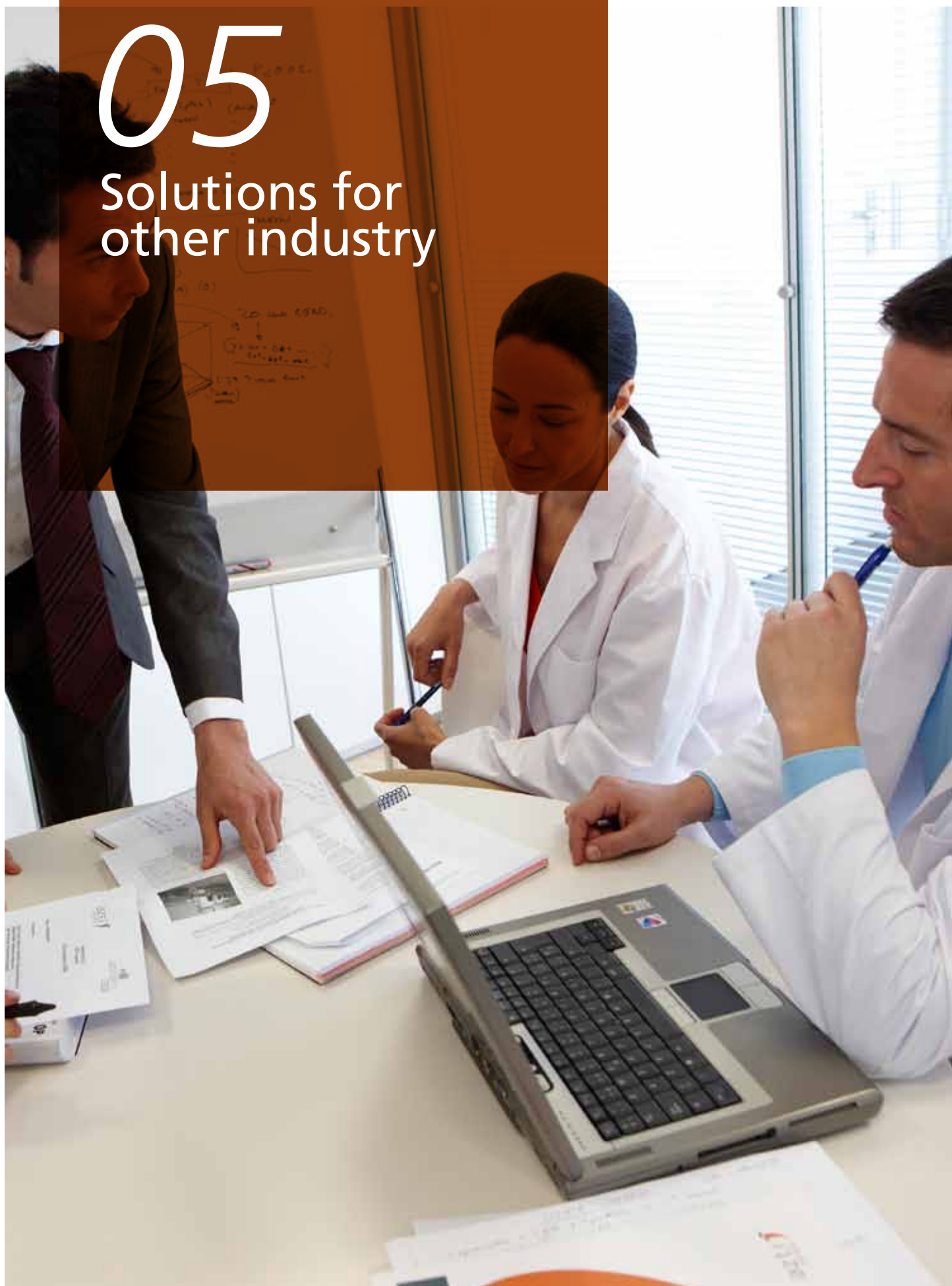
04.7

Food safety and traceability

- / **Safety and efficacy of food components in fodder:** Anti-oxidant and anti-inflammatory assessment of functional feed components; Gnotobiotic models on molecular interaction at microbiota level (probiotics, pathogenic agents); Immunological studies in species through addition of lipopolysaccharides, peptides, prebiotics, probiotics, etc.; Bacteriophage technology development to minimise the risk of disease.
- / **Aquaculture food shelf-life estimate/ forecast**
- / **Traceability of aquaculture species**

05

Solutions for other industry



05.1

Environmental Impact Assessment Studies and Marine Environment Monitoring Schemes

- / **Prepare Environmental Impact Assessment (EIA) studies** adapted to the specific requirements and particularities of marine environments.
- / **Design and implement Environmental Monitoring Programmes (EMP)** adapted to aquatic transitional, coastal and ocean ecosystems.

05.2

Assessment of marine biofouling in actual conditions

- / **Studies and testing** to validate the best treatments against the growth of biofouling and marine corrosion.

05.3

Modelling of ocean-meteorological processes and parameters

- / For the **planning, design and selection of sites**
- / For the **development of alert and warning systems detecting** the arrival of objects, substances or animals to shore; and analysis and studies related to climate change.

05.4

Marine environment quality monitoring networks

- / To determine environmental recovery and ensure a sustainable use of marine resources.

05.5

Marine environmental restoration studies: seagrass beds

- / **Bed charts**
- / **Preparation of habitat suitability models**
- / **Working with seeds**
- / **Transplanting**

05.6

Eco-toxicological studies

- / **Pollutant impact assessment on sediments and transitional and coastal waters**

05.7

Assessment of the ecological and environmental status of the marine environment

- / **Using the AMBI tool**

05.8

Fishery and living marine resource assessment

05.9

Coast and sand dunes management tools: KOSTASystem

- / **Objective tools through real-time camera monitoring**, to determine parameters such as dangerous tides on beaches, sand movements, user density, wave characterisation or overflowing of docks and jetties.

06

Solutions for administrations



06.1

Environmental Impact Assessment Studies and Marine Environment Monitoring Schemes

- / **Prepare Environmental Impact Assessment (EIA) studies** adapted to the specific requirements and particularities of marine environments.
- / **Design and implement Environmental Monitoring Programmes (EMP)** adapted to aquatic transitional, coastal and ocean ecosystems.

06.2

Assessment of marine biofouling in actual conditions

- / **Studies and testing** to validate the best treatments against the growth of biofouling and marine corrosion.

06.3

Modelling of ocean-meteorological processes and parameters

- / For the **planning, design and selection of sites**
- / For the **development of alert and warning systems detecting** the arrival of objects, substances or animals to shore; and analysis and studies related to climate change.

06.4

Marine environment quality monitoring networks

- / To determine environmental recovery and ensure a sustainable use of marine resources.

06.5

Marine environmental restoration studies: seagrass beds

- / **Bed charts**
- / **Preparation of habitat suitability models**
- / **Working with seeds**
- / **Transplanting**

06.6

Eco-toxicological studies

- / **Pollutant impact assessment on sediments and transitional and coastal waters**

06.7

Assessment of the ecological and environmental status of the marine environment

- / **Using the AMBI tool**

06.8

Fishery and living marine resource assessment

06.9

Coast and sand dunes management tools: KOSTASystem

- / **Objective tools through real-time camera monitoring**, to determine parameters such as dangerous tides on beaches, sand movements, user density, wave characterisation or overflowing of docks and jetties.

06.10**Support for food sector action plan
and strategies development**

- / Comprehensive management plans for by-products.
- / Multicriteria decision tools for by-products recovery at regional and state level.
- / Tools for harmonized calculation and reporting of sustainability indicators.
- / Training and awareness for food industry.
- / Sectoral environmental behavior diagnostics.
- / Sectoral agreed improvement plans.
- / Comprehensive waste treatment and management for zone densely occupied by food companies.
- / Sectoral plans to improve industrial eco-efficiency.
- / Sectoral occupational risks prevention plans (ergonomic improvement).





06.11

Collaboration with the autonomous communities in food products analysis

- / Performing physicochemical, sensory and biological analyzes of these products.
- / AZTI is an official food control laboratory designated by the MAGRAMA.
- / Food fraud control campaigns.

The background of the page is a microscopic image showing several large, circular cells. Each cell contains a prominent, dark, spherical nucleus. The cytoplasm is lighter and has a granular texture. A semi-transparent brown rectangular overlay is positioned on the left side of the page, partially covering the cells. The number '07' is printed in a large, white, serif font within this brown area.

07

Solutions for
companies in the
animal feed,
cosmetics,
nutraceutical and
pharmaceutical
sectors

07.1

Test to assess functional molecules effectiveness

- / Impacts are studied in vivo in a whole animal model. More realistic response. Effects which can be studied:

- Antioxidant
- Immunostimulant
- Anti-inflammatory
- Probiotics
- Prebiotics

07.2

Test to assess toxicity of chemicals

- / A testing panel to determine the toxic impact of: metallic nanoparticles (NPs) particles, HAPs, heavy metals, plant protection products and other additives or individual or mixed chemical pollutants.

Testing includes:

- Acute toxicity
- Gene expression
- Stress and oxidative damage production
- Inflammation
- Bio-availability/bio-accessibility (in vitro)
- Toxicity and organ-specific bio-accumulation (adults)

- / **Fish embryo test solution**, official OECD 236 to determine the toxic impact of chemicals (waste water from food and non-food companies).



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